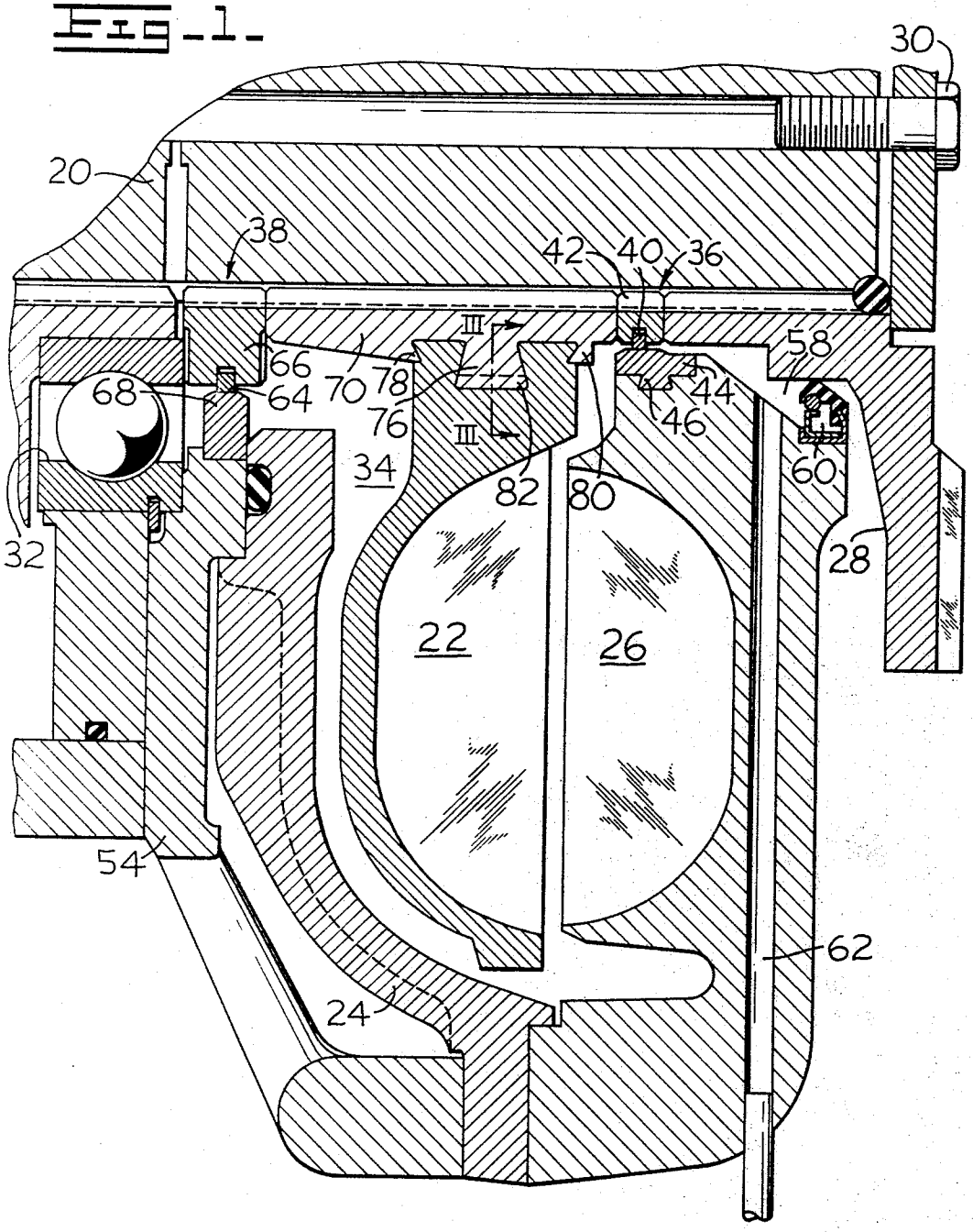
July 11, 1967 A. H. BERTRAM ETAL 3,330,386

SEALING ARRANGEMENT FOR RETARDER SYSTEM

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Fig. 1.



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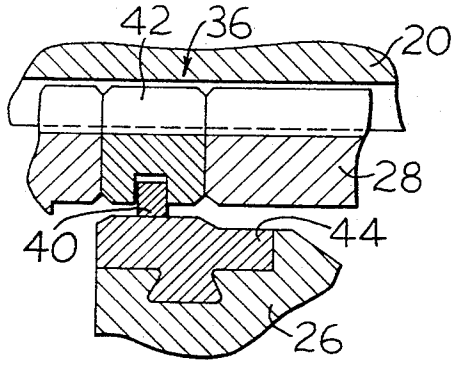


Fig-2-

Fig-3-

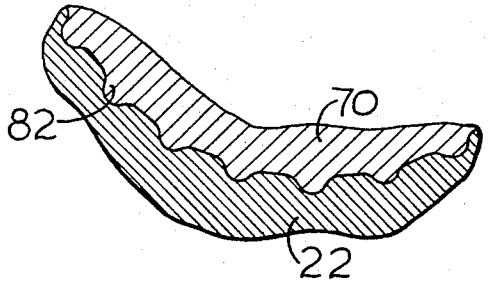
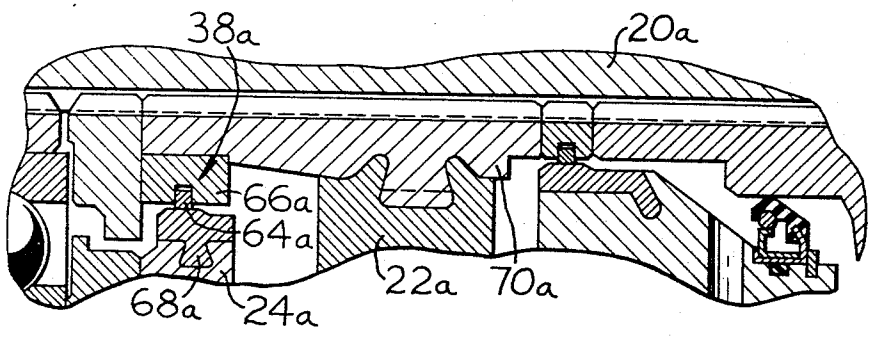


Fig-4-



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United States Patent Office 3,330,386
Patented July 11, 1967

3,330,386

SEALING ARRANGEMENT FOR RETARDER SYSTEM

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Filed Mar. 21, 1966, Ser. No. 535,837
3 Claims. (Cl. 188—90)

This invention relates to fluid retarders of the kind employed to augment the action of brakes on large machines.

Retarders operate under high pressures and usually leak considerably. This creates a necessity for frequently replacing oil in the system which is a time consuming operation. Furthermore, failure to replace the oil results in faulty operaton.

It is, therefore, an object of the inevntion to provide a retarder system with an improved sealing arrangement and construction which will substantially eliminate the aforementioned problems encountered with prior art systems.

Further and more specific objects and advantages of the invention are made apparent in the following specification wherein the invention is described in greater detail with reference to the accompanying drawings.

In the drawings:

FIG. 1 is a schematic sectional view of a retarder system in accordance with the present invention;

FIG. 2 is an enlarged sectional view illustrating in detail the sealing arrangement of the present invention;

FIG. 3 is a cross sectional view taken on the line III—III of FIG. 1; and

FIG. 4 is an enlarged sectional view illustrating a modified embodiment of the sealing arrangement of the present invention.

Referring to FIG. 1, a rotatable externally splined shaft **20** is shown in assembled relation with respect to the surrounding casing of a conventional retarder or hydrodynamic brake. In general, the retarder comprises a rotor **22** surrounded by a casing including rotor back-up member **24**, stator **26** and an output flange **28**. The rotor, rotor back-up member and stator are preferably constructed of aluminum. A bolt clamping arrangement **30** cooperates with output flange **28** to clamp the assembly in aligned position with the inner race of an antifriction bearing assembly **32**.

In operation, fluid is admitted to a cavity **34** of the retarder assembly and the opposed vanes or blades on rotor **22** and stator **26** create a resistance to movement of the rotor which is connected indirectly with the wheels of a vehicle. Retarders operate under high pressures and to prevent faulty operation due to fluid leakage a suitable sealing arrangement must be provided. The present invention comprises a novel construction and arrangement of piston ring seals **36** and **38** to keep the leakage problem within tolerable limits.

The seal assembly **36** comprises a high hardness piston ring **40** fitted within an adapter or carrier **42** which is received on the splined shaft **20** for rotation therewith. Because the high hardness piston ring **40** would soon wear into the aluminum surface of stator **26** it is necessary to provide a wear-resistant insert **44** which is preferably constructed of cast iron or similar material. However, due to the fact that great temperature increases are often experienced during the operation of a retarder, the cast iron insert **44** cannot be simply pressed into the aluminum part because the coefficients of expansion of the two metals are dissimilar. The insert **44** is provided with an annular flaring shoulder or tenon **46** so that rigid interlocking of the two components is assured. The two parts are assembled while hot and since aluminum has the greater expansion rate it seizes the insert as it cools and permanently holds it in place.

As best shown in FIG. 2, when the inner chamber of the retarder is pressurized, the piston ring **40** is expanded against insert **44** and held stationary. Carrier **42** is driven and rotates with the shaft. Sealing is accomplished by ring **40** being pushed against the side of the groove in carrier **42** and seating against the insert **44** thereby preventing oil from passing through. A limited amount of leakage, which is normal with piston ring seals, is confined within a compartment **58** by a conventional lip-type seal **60** which is fixed to stator **26** and mates against the output flange **28**. A drainage line **62** returns fluid from this compartment to a torque divider sump (not shown).

The seal assembly **38** closes off the other side of compartment **34** and is similar in all material respects to seal assembly **36**. A piston ring **64** within a carrier **66** mates with a cast iron insert **68** which is pressed into a cast iron adapter **54**. Leakage from compartment **34** returns directly to the torque divider sump (not shown).

The carriers **42** and **66** are made as separate parts so that they may be replaced as wear occurs. The tapered edges of the inserts **44** and **68** allow the piston rings and their respective carriers to be inserted into the assembly without the use of ring compressors. It is customary to use a 30° taper, but the angle is not critical. In addition, the inserts **44** and **68** may vary somewhat in material composition and hardness to provide the optimum seating surface for rings **40** and **64**, respectively.

A further aspect of the invention involves the use of a relatively large cast iron insert **70** on the inner diameter of the aluminum retarder rotor **22**. It has been found that the clamping force between tightening bolt **30** and bearing assembly **32** tends to relax or loosen due to fretting and wear between the ends of the rotor hub and the adjacent pieces when utilizing an aluminum rotor. As previously noted the splined shaft **20** and all parts retained on this shaft are preferably constructed of a hard metal, such as steel, with the exception of the rotor **22** which is preferably aluminum. Consequently, as the temperature increased to a range around 350° F. during operation of the retarder assembly, the different expansion rates between the steel shaft and aluminum rotor hub caused working of the metal on the ends of the rotor hub and additionally resulted in a pressure build-up great enough to yield the aluminum where the hub mated with the shaft. After this cycle was repeated many times, the fretted rotor hub vibrated through the backlash of the splined teeth to such an extent that the bolt **30** lost its effectiveness as a clamping member and this ultimately caused failure of the bearing **32**. The cast iron insert or rotor hub **70** eliminates the aforementioned problems since it has an expansion rate almost equal to that of steel.

The insert **70** is coupled to the rotor **22** with a large central annular flaring tenon **76** and with outer half tenons **78** and **80**. As best shown in FIG. 3 lugs **82** are incorporated between the rotor **22** and insert **70**. During operation of the retarder, the rotor tends to hydraulically couple itself to the stator so that large values of torque are transmitted to shaft **20** by the insert **70**. By providing the driving lugs **82**, the bond between insert **70** and rotor **22** is not required to transmit this force.

The modified construction shown in FIG. 4 is basically the same as that depicted in FIG. 1. However, the seal assembly **38***a* has been slightly relocated such that the carrier **66***a* is now a part of the rotor insert **70***a* and the piston ring **64***a* seats against a hardened insert **68***a* affixed to the rotor backup member **24***a*.

We claim:

1. A retarder system for a vehicle comprising a casing, a shaft passing therethrough, at least one wall of said casing comprising a bladed stator, a rotor secured to said shaft and having radially extending blades confronting said stator and rotatable in the space defined by said casing, fluid sealing means interposed between said casing and said shaft on each side of the juncture of said rotor with said shaft, said sealing means comprising a removable adapter secured to said shaft and rotatable therewith, said adapter being separable from both said rotor and said shaft, a hard annular piston ring extending from a groove formed in the radially outer surface of said adapted, and a hardened wear insert positioned in said casing and adapted to be sealingly engaged by said piston ring to insure that the compartment defined by said casing is substantially fluid tight.

2. A retarder system as set forth in claim 1 wherein said rotor and said casing components are constructed of aluminum and said hardened wear inserts are constructed

of cast iron, said cast iron inserts further having an annular radially outwardly flared tenon received within a mating groove formed in said casing.

3. A retarder system as set forth in claim 2 wherein said shaft is splined and said rotor is provided with a hardened metal hub for connection thereto, said hub being joined to said rotor by annular radially flared tenon means, and cooperating lug means formed between said tenon means and said rotor.

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